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THE COLLEGE COMMISSIONS.

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THE HISTORIES, ORGANIZATIONAL STRUCTURES, MODES OF OPERATION, GOALS, AND SPECIFIC ACTIVITIES OF EIGHT COLLEGE SCIENCE COMMISSIONS ARE PRESENTED. THE GOAL OF THE EIGHT COLLEGE SCIENCE COMMISSIONS IS TO BRING UNDERGRADUATE SCIENCE INSTRUCTION CLOSER TO THE RESEARCH FRONTIER, UPDATE COURSES, AND FOSTER THE SPIRIT OF INQUIRY. INTERCOMMISSION ACTIVITIES LISTED ARE (1) REGIONAL SCIENCE TEACHING CENTERS, (2) THE LABORATORY IN SCIENCE INSTRUCTION, (3) INTEGRATED SCIENCE COURSES, (4) SCIENCE IN THE TWO-YEAR COLLEGE, (5) COMPUTERS IN INSTRUCTION, AND (6) COLLEGE INSTRUCTIONAL PERSONNEL. ACTIVITIES INVOLVING THE JOINT EFFORTS OF TWO OR THREE COMMISSIONS ARE PROGRAMS INVOLVING (1) BIOLOGY-MATHEMATICS, (2) PHYSICS-CHEMISTRY, (3) BIOLOGY-AGRICULTURE, (4) PHYSICAL SCIENCE FOR THE NON-SCIENTIST, (5) BIOLOGY-CHEMISTRY, (6) CHEMISTRY-MATHEMATICS, (7) GEOLOGY, (8) GEOLOGY-CHEMISTRY-PHYSICS, (9) ENGINEERING-BIOLOGY-AGRICULTURE, AND (10) AGRICULTURE-CHEMISTRY-MATHEMATICS-PHYSICS. THE COMMISSIONS ARE (1) COMMISSION ON EDUCATION IN AGRICULTURE AND NATURAL RESOURCES, (2) COMMISSION ON UNDERGRADUATE EDUCATION IN THE BIOLOGICAL SCIENCES, (3) ADVISORY COUNCIL ON COLLEGE CHEMISTRY, (4) COMMISSION ON ENGINEERING EDUCATION, (5) COMMISSION ON COLLEGE GEOGRAPHY, (6) COUNCIL ON EDUCATION IN THE GEOLOGICAL SCIENCES, (7) COMMITTEE ON THE UNDERGRADUATE PROGRAM IN MATHEMATICS, AND (8) COMMISSION ON COLLEGE PHYSICS. SOURCES OF INFORMATION IN EACH AREA ARE GIVEN. (DH)

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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ULTURE BIOLOGY CHEMISTRY ENGINEERING GEOGRAPHY GEOLOGY MATHEMATICS PHYSICS

July, 1967

THE COLLEGE SCIENCE COMMISSIONS

The purpose of this publication is to present a brief overview of the histories, organizational structures, modes of operation, and separate goals of the eight college science commissions. The success of any commission must ultimately be measured in terms of the changes it helps to effect in undergraduate institutions. The substance and number of such changes, in turn, is limited by the degree to which the commission's work becomes known to undergraduate institutions. It is hoped that the present publication will aid in such dissemination.

The primary goal of the eight college science commissions is to bring undergraduate science instruction closer to the research frontier; their aim is not only to update the content of undergraduate courses but also to bring to bear on the instructional process that spirit of inquiry which marks creative research.

Through their members and through panels, committees, national and regional conferences, etc., the commissions involve many imaginative scientists and science educators—often men well-known for their contributions to research—in the task of instructional improvement. The products of this involvement are spread by the commissions well beyond the relatively few institutions with high concentrations of intellectual resources. The example of the concern and activity of commission members and other highly-regarded scientists brings to the task of instructional research and development an increased professional status and makes easier the involvement of more and, in particular, younger, scientists.

Although most of the college science commissions are independent *ad hoc* organizations, all have strong ties (through *ex officio* representation, etc.) with other organizations within their professions. These connections have led to cooperative efforts and a sharing of responsibilities. This cooperative approach marks intercommission relations as well, particularly at the professional staff level. The commission executive officers meet periodically, publications are routinely exchanged, observers are invited to conferences, etc. There are also several formal intercommission activities, described in a following section.

Just as there are common features in past and present commission operations, the commissions have, in some respects, a common view of the future. All are aware of the necessarily long-term commitments needed to bring about change, of the long time which must pass between identification of a contribution to improved instruction and its wide implementation in academic science. Each of the Commissions, therefore, is seeking to invent and bring about the establishment of mechanisms which will make continuing analysis, innovation, and self-renewal integral parts of college-level instruction in science.

CONSULTANT SERVICE

Most of the commissions offer a Consultant Service. This service is made available to an institution desiring advice on course and curriculum improvement. Usually, the consultant spends one or two days on campus and submits a detailed report following the visit.

In all cases, the commissions offer some financial support toward covering the cost of the consultant visit; the precise amount of this support differs among the various commissions. Procedural details are available from each of the individual commissions.

INTERCOMMISSION ACTIVITIES

The various commissions maintain close communication with each other, chiefly through periodic meetings of directors and chairmen and routine exchange of publications and reports. Identification of a number of problems in science education that transcend discipline boundaries, as well as others that are common to more than one commission, led to the development of several intercommission study groups and panels. These groups permit a joint attack on various problem areas and/or help to minimize unnecessarily redundant activities on the part of the individual commissions.

Following is a list of current programs and activities involving most, if not all, of the commissions:

1. **Regional Science Teaching Centers.** The Commission on College Physics (CCP) acts as a clearinghouse for information on Science Teaching Centers and periodically circulates reports to the other commissions as centers come into existence and as they pertain to undergraduate education in the sciences.

2. **The Laboratory in Science Instruction.** An intercommission panel was established to examine the role of the laboratory in science instruction. Preliminary discussions revealed that the laboratory goals of each discipline are essentially the same, and that a joint attack on the problem would be appropriate. The Commission on Undergraduate Education in the Biological Sciences (CUEBS), in cooperation with the Commission on Engineering Education (CEE), is administering this panel.

3. **Integrated Science Courses.** The Advisory Council on College Chemistry (AC_3) is assuming responsibility for assembling information on existing and proposed integrated science courses, both for science majors and for nonscience majors. Consideration of joint commission activities in this area will depend upon the data gathered by AC_3.

4. **Science in the Two-Year College.** An intercommission study group was established to consider the role of the two-year college in science instruction. The group consists of one or two representatives from each relevant Commission, plus representatives of appropriate organizations (e.g., American Association of Junior Colleges, American Association for the Advancement of Science, American Psychological Association). The administration of the panel is the responsibility of CUEBS.

5. **Computers in Instruction.** CEE is acting as a clearinghouse for information in all areas of computer use, including computer graphics, computer animated films and computational functions. Periodic reports are issued by CEE to the other Commissions.

6. **College Instructional Personnel.** An intercommission study group was established to consider the pre-service preparation and in-service training of college science instructors. While the substantive preparation of personnel remains the prerogative of the disciplines, the needs in pedagogical preparation are common to all disciplines. This panel is currently being administered by CUEBS in cooperation with AAAS; it is expected that AAAS will eventually assume responsibility for administering the panel.

Following is a list of activities involving the joint efforts of two or three commissions:

1. **Biology-Mathematics.** A CUPM (Committee on the Undergraduate Program in Mathematics) - CUEBS committee is fostering the creation of one or more source books on biomathematics. These materials would provide the mathematics instructor with a sophisticated pool of problems in biology for use in illustrating principles in mathematics; at the same time they would provide the biology instructor with examples demonstrating the application of mathematical techniques to solution of problems in biology.

2. **Physics-Chemistry.** A CCP-AC_3 committee is exploring the possibilities of an integrated introduction to the physical sciences for majors in physics, chemistry, and possibly biology.

3. **Biology-Agriculture.** Several committees, jointly funded by CUEBS and the Commission on Undergraduate Education in Agriculture and Natural Resources (CEANAR), have explored the preparation in biology needed by students preparing for careers in agriculture.

4. **PSNS.** The Physical Science for the Non-Scientist (PSNS) Project is preparing an integrated program in the physical sciences for prospective elementary school teachers. The project is funded by a National Science Foundation (NSF) grant to the Renssalaer Polytechnic Institute. CCP and AC_3 jointly sponsored the early discussions which led to the formation of the project, and still play an advisory role.

5. **Biology-Chemistry.** A series of monographs is being created to cope with some of the subject matter encountered at the interface between chemistry and biology. These materials are aimed at the sophomore-junior level of sophistication, and their production is supported by outside funds. CUEBS and AC_3 jointly sponsored the early discussions which led to the generation of the monograph series.

6. **Chemistry-Mathematics.** An AC_3-CUPM committee is attempting to define the preparation in mathematics needed by students planning for careers in chemistry.

7. **Climatology.** The feasibility and desirability of developing a program in climatology for undergraduate students is being considered by the Agriculture, Geography, Geology, and Biology Commissions.

8. **Geology-Chemistry-Physics.** An attempt to define the preparation in physical sciences common to majors in geology, chemistry, and physics is being jointly supported by these Commissions.

9. **Engineering-Biology-Agriculture.** An attempt is being made to define the current and anticipated needs of engineers with more than superficial knowledge of concepts in biology, and the converse. Such needs are currently apparent in the areas of biomedical engineering and in environmental control engineering.

10. **Agriculture-Chemistry-Mathematics-Physics.** With assistance from the ACS, CCP, and CUPM, CEANAR is exploring desirable preparation in these three areas for students in agriculture and renewable natural resources.

COMMISSION ON EDUCATION IN AGRICULTURE AND NATURAL RESOURCES

During the past several years, the surpluses of all but a few American agricultural products have dwindled to minimum levels. Meeting world food needs has become a problem of great importance. At the same time, there has been rapid and significant change in the science and management of our renewable natural resources. National attention has been focused on the wide use of management of these resources.

These and other significant developments combine to emphasize the critical importance of education in agriculture and renewable natural resources. The purpose of the Commission on Education in Agriculture and Natural Resources (CEANAR) is to assist in the development of the very best education possible in these areas.

The Commission has two major goals. The first is to stimulate improvement in the education of undergraduates in agricultural and renewable natural resource fields. This is done by continuously reviewing trends in education for undergraduate majors; stimulating discussion, reevaluation and improvement in undergraduate courses and curricula; and preparing recommendations for the development of academic programs in the future.

The second goal is to assist in the development of the agricultural and renewable natural resource aspects of general education.

THE COMMISSION

The Commission operates within the Division of Biology and Agriculture of the National Research Council, the operating agency for the National Academy of Sciences and the National Academy of Engineering. Financial support is provided by a contract between the National Science Foundation and the National Academy of Sciences.

The Commission was first formed in 1961 as the [illegible]ittee on Educational Policy in Agriculture, by the Agr[illegible]tural Board of the Division of Biology and Agriculture, National Research Council. The Commission was renamed July 1, 1965. Russell E. Larson, Dean of the College of Agriculture, the Pennsylvania State University, became CEANAR chairman July 1, 1966.

One of the major concerns in agriculture and renewable natural resources education is curriculum content. This is, therefore, a concern of the Commission, as evidenced by most of the major current activities, including the following:

1. basic science and mathematics content of curricula;
2. course and curriculum content in the agricultural and natural resource disciplines;
3. conferences co-sponsored with the scientific and professional societies;
4. undergraduate education in renewable natural resources;
5. two-year programs in agriculture and renewable natural resources;
6. agricultural and renewable natural resources in general education; and
7. campus visiting groups.

These activities are discussed in the following paragraphs.

CEANAR recently co-sponsored a national conference in which the biological science education needs of undergraduates in agriculture and renewable natural resources were explored. Other sponsors were the Commission on Undergraduate Education in the Biological Sciences (CUEBS); the Resident Instruction Section, Division of Agriculture, National Association of State Universities and Land Grant Colleges; and the National Association of Colleges and Teachers of Agriculture. Reports prepared by several action committees, formed by CEANAR and CUEBS, provided resource material for the Conference.

Following publication of the Conference proceedings, the Commission plans to hold several regional conferences, structured to consider the feasibility of implementing the recommendations contained in the proceedings.

Education in the physical sciences and mathematics will be given full attention during the coming months by committees in chemistry, physics, and mathematics. Each of these com-

mittees will be asked to study and recommend desirable preparation in their respective areas for undergraduates in agriculture and renewable natural resources.

This effort will be concluded with a general conference involving all three areas represented by the committees, tentatively scheduled for fall, 1967. CEANAR has received assistance from the college commissions in chemistry, physics, and mathematics in the planning and conducting of this study.

The Commission has initiated a series of conferences which are designed to assess the status of course and curriculum content in major agricultural and natural resource disciplines, to recommend action as seems necessary, and to suggest mechanisms for implemention. This type of conference encompasses several related disciplines, species areas and/or commodity areas within agriculture and renewable natural resources. Attendance is limited to about 40-50 participants.

A conference on undergraduate teachers in the animal sciences was held in May, 1966, and a similar conference on undergraduate teaching in the plant and soil sciences was held in March, 1967. Planning is under way for a conference on undergraduate teaching in the renewable natural resources.

The Commission is cosponsoring a series of conferences with scientific and professional societies. The purpose is to generate widespread discussion, among as many persons as possible, of contemporary issues in undergraduate teaching. Conferences or symposia have been held jointly with the scientific and professional societies in dairy science, horticultural science, agricultural economics and plant pathology. Similar conferences will be held with the societies in animal science in August, 1967, and in agronomy, November, 1967.

In view of the important role played by scientific and professional societies in undergraduate education, the Commission has cosponsored, with the National Association of Colleges and Teacners of Agriculture, a symposium designed to improve communications between the societies and faculty members and to explore further the role of the society in the teaching process.

The Commission Panel on Natural Resource Science has drafted a preliminary report on the education of future scientists and managers in the field of renewable natural resources. The report is now being prepared for publication.

FUTURE PLANS

The Commission has formed a panel on two-year programs. This panel will be asked to make a study of two-year programs in agriculture and natural resources and "pre-agriculture and natural resources." Members will focus on such matters as the role and goals of these programs, curriculum problems, articulation with four-year institutions, and faculty and facility improvement.

A panel also is being formed to explore the role of agriculture and renewable natural resources in the general education of all students. The Commission is concerned that the nation's citizens become more aware of their relationship to, and dependence upon, the natural world. This is particularly important in view of the growing problems associated with the quality of man's environment.

Finally, the Commission has conducted during the past several years a "visiting panel" program, under which panels consisting of four to six members have visited college campuses to study and advise on undergraduate education in agriculture and the renewable natural resources. The Commission plans to continue to organize such panels for interested institutions.

One of the outgrowths of these comprehensive visiting panels is the "visiting specialist" program. This program provides for a limited number of visits by individuals to campuses, upon request by individual institutions, to study and advise on matters or courses and curricula.

COMMISSION MEMBERS

Commission members are Russell E. Larson (Chairman), Dean, College of Agriculture, The Pennsylvania State University; Daniel G. Aldrich, Jr., Chancellor, University of California, Irvine; Lincoln Constance, Professor, Department of Botany, Director, Herbarium, University of California, Berkeley; George R. Ferguson, President, Geigy Agricultural Chemicals (Ardsley, New York); George A. Gries, Head, Department of Biological Sciences, University of Arizona; A. D. Hiltz, Professor, Department of Agronomy, Purdue University; Roy M. Kottman, Dean, College of Agriculture and Home Economics, The Ohio State University, Director, Ohio Agricultural Research and Development Center, and Director, Cooperative Extension Service; Darrel S. Metcalfe, Director of Resident Instruction, College of Agriculture, University of Arizona; and Lloyd E. Partain, Assistant to the Administration on Recreation, Soil Conservation Service, United States Department of Agriculture.

PUBLICATIONS (Copies are free unless otherwise indicated)

1. Threads of life. 1964. A brochure describing careers in agricultural science, with emphasis on biological science aspects of agriculture. Copies may be obtained only from colleges, schools, and departments of agriculture in institutions of higher education, and **not** from the Commission on Education in Agriculture and Natural Resources. A list of these colleges, schools and departments is available from the Commission office.
2. The agricultural sciences. 1965. BioScience 15(5):349. A statement on the nature and challenge of the agricultural sciences.
3. Farm, non-farm origin and some effects on students in colleges of agriculture. 1964. Committee on Educational policy in Agriculture. Mimeo Series Publication #1, January.
4. Report of a seminar on opportunities in business for B. S. graduates of colleges of agriculture. 1964. Committee on Educational Policy in Agriculture. Mimeo Series Publication #3, June.
5. A survey of placement, agriculture and forestry, July, 1963 to June, 1964. Committee on Educational Policy in Agriculture. Mimeo Series Publication #4, October.
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7. Geyer, Richard E. 1965. Poultry science in general education—and in recruiting. Presented to the Poultry Section of the Association of Southern Agricultural Workers, February 2.

8. Gries, George A. 1964. Educational objectives in the agricultural sciences. Symposium on Education in Dairy Science, sponsored by Education Section, American Dairy Science Association, June 23. J. Dairy Sci. 48(1):115-119.

9. Geyer, Richard E. 1965. The ferment in undergraduate biology—does it make any difference? Presented to the Western Region Meeting of Deans and Directors of Resident Instruction, University of Hawaii, March 11.

10. Geyer, Richard E. 1965. Excellence in the education of future agricultural communicators. Annual meeting of the American Association of Agricultural College Editors, Rutgers University, July 8.

11. Feed manufacturers of the future. Based on a pilot study by the Committee on Educational Policy in Agriculture. Feed Age, 15(10):22.

12. Trends and issues in education in the agricultural sciences. BioScience 15(11):711.

13. Geyer, Richard E. 1965. Training for applied biology. Presented to the 1965 Summer Institute for Teachers of Introductory Biology at the College Level, Williams College, Williamstown, Massachusetts, July 30.

14. Proceedings of the conference on undergraduate education in dairy science. August 10-11, 1965. Lincoln, Nebraska. J. Dairy Sci. 1966: 525-600.

15. Geyer, Richard E. 1966. Consolidation of courses and curricula in agriculture. Presented at the Meeting of Northeast Region Deans and Directors of Resident Instruction, New York, April 5.

16. Geyer, Richard E. 1966. Trends in undergraduate education in renewable natural resources. Presented at the Meeting of the Southern Region Deans and Directors of Resident Instruction in Agriculture, Tampa, Florida, March 31, 1966.

17. Geyer, Richard E. 1966. Outdoor recreation and parks management curricula in colleges of agriculture and forestry. Presented at the 15th Annual Governor's Conference on Recreation and Parks, Maryland Recreation and Parks Society, Gaithersburg, Maryland, May 10.

18. Conference on Undergraduate Education in Horticultural Science. Proc., American Society for Horticultural Science. September, 1966. (Price: $2.00 from Society, P. O. Box 109, St. Joseph, Michigan 49085)

19. Larson, Russell E. [Chairman]. 1966. Activities of the Commission on Education in Agriculture and Natural Resources. Presented to the Resident Instruction Section, Division of Agriculture, National Association of State Universities and Land-Grant Colleges, Washington, D. C., November 14.

20. Teachers of agricultural economics. 1966. Proc., Symposium, Virginia Polytechnic Institute, August 17-20, Farm Econ. 49(1):Part II.

21. Conference on Undergraduate Teaching in the Animal Science, Washington, D. C., Proc., May 20-21, 1966.

24. Undergraduate education in the biological sciences, agriculture and natural resources. 1967. Papers, symposium co-sponsored with CUEBS and Section Q (Education) of the American Association for the Advancement of Science (AAAS). Annual meeting of AAAS, December 27, 1966. Sci. Educ. 51(2):116-129.

(In Preparation)

22. Undergraduate teaching in poultry science. Papers, annual meeting of the Poultry Science Association, August, 1965.

23. Conference on Undergraduate Education in the Biological Sciences for Students in Agriculture and Natural Resources, co-sponsored with the National Association of Colleges and Teachers of Agriculture (NACTA), the Resident Instruction Section of the National Association of State Universities and Land-Grand Colleges (NASULGC), and the Panel on Preprofessional Training for the Agricultural Sciences (PPTAS), of the Commission on Undergraduate Education in the Biological Sciences (CUEBS). Proc., November 11-12, 1967.

25. Conference on Undergraduate Teaching in the Plant and Soil Sciences. Proc., March, 1967.

26. NACTA and the professional societies. Proc., symposium, April, 1967.

27. An assessment of undergraduate education in renewable natural resources. Panel on Natural Resource Science.

Further information can be obtained by writing to the Commission on Education in Agriculture and Natural Resources of the Division of Biology and Agriculture, National Research Council-National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418.

COMMISSION ON UNDERGRADUATE EDUCATION IN THE BIOLOGICAL SCIENCES

The primary concern of the Commission on Undergraduate Education in the Biological Sciences (CUEBS) is to help close the gap between recent major advances in biological research and the content of undergraduate courses in biology. CUEBS activities are directed towards improving and modernizing biology curricula, and are focused on ways and means of improving the effectiveness of instructional programs. The over-all technique is to stimulate discussion in order to uncover and discover good ideas and generate imaginative programs in biological education, and to communicate these to the biological community as a whole.

While the Commission is eager to provide all the help it can to individuals, departments, institutions, and even broader groups, it recognizes that in the final analysis effective action must come at the local level; successful implementation of recommendations is dependent upon careful adaptation to local situations. Thus, CUEBS sees its role as being stimulative and provocative, but in no way prescriptive.

THE COMMISSION

The Commission consists of 24 biologists elected from a pool of nominations submitted by the various biological societies and by individual biologists; the President of the American Institute of Biological Sciences (AIBS) is an ex-officio member of the Commission. Each Commissioner serves three years, and terms are staggered so that eight Commissioners are replaced each year. An executive office, currently located in Washington, D.C., handles the day-to-day operations of the Commission and coordinates the various programs and activities.

Problem areas identified by the Commission are assigned to panels and study groups for more intensive deliberation and recommendations. These latter groups consist of knowledgeable persons, Commissioners and non-Commissioners alike, who might contribute to the solution of the problems. Thus, Commission programs, recommendations, and positions reflect the best thinking of many biologists throughout the nation, rather than simply the twenty-four individual Commissioners.

PANELS

Panels and study groups (which attack problems of more specific dimensions than those undertaken by panels) exist for finite periods of time and are disbanded upon completion of their missions. This flexible structure permits CUEBS programs to evolve in an orderly fashion as the problems become more sharply defined; at the same time, turnovers in personnel provide the Panels and the Commission with a continual influx of new ideas and imaginative approaches. Decisions as to the scope and depth of various programs are based largely on the availability of talent and resources.

Four Panels have dealt directly with courses and curricula for biologists. The **Panel on Undergraduate Major Curricula** has prepared a manuscript that presents a detailed profile of the core programs at four major institutions; since many biology departments throughout the country are currently re-examining and reorganizing their undergraduate offerings with an eye towards establishing a core program, the publication should be extremely useful as a basis for intra-institution deliberations. The **Panel on Preprofessional Training for the Agricultural Sciences**, the **Panel on Preprofessional Training for the Medical Sciences**, and the **Panel on the Preparation of Biology Teachers** were each asked to direct their attention to the programs in biology needed by students preparing for careers in their respective applied areas. Generally, these panels are recommending a core program in biology in common with that presented to biology majors, plus some additional overlay programs more specific to the specialty areas. A **Biology Methods Committee** (jointly supported by BSCS) is attempting to generate the methodology overlay needed by high school biology teachers.

A related curriculum panel, the **Panel on Interdisciplinary Cooperation**, was asked to make recommendations on the preparation in cognate areas needed by students in biology. At the same time, the Panel is identifying (and proposing methods of reducing) gaps in instructional materials supporting programs in the interface between biology and the other discipline areas. The Panel currently operates as an assemblage of subpanels, each concerned with a specific interface area, and each working in close cooperation with equivalent groups supported by related Commissions.

The sixth curriculum panel, the **Panel on Biology in Liberal Education**, sponsored a Colloquium in 1965 which considered the problem of biology in a liberal education. A report of the Colloquium has recently been published, and several ideas originating at the Colloquium are being pursued by various individuals and groups. A committee is being established to consider further the role of biology in a general university education.

Four panels might be considered supportive in that they are dealing with (or have dealt with) the effectiveness of instructional techniques, rather than the content materials themselves. The **Panel on Instructional Materials and Methods** experimented with the creation of instructional materials and learning packets, and evolved into a committee designed to explore how a Center for Biological Education might provide continuity in the improvement of instructional techniques and materials. The **Panel on Evaluation and Testing** has completed work on a biology test item booklet designed to strengthen and improve aspects of evaluation in undergraduate biology course; the manuscript is currently undergoing editorial review preparatory to publication. The **Panel on Biological Facilities** has produced guidelines to assist departments and institutions in making the most efficient use (in terms of instructional programs) of available construction funds; it is now preparing a basic library list to aid developing institutions. The **Panel on College Instructional Personnel**, though its three subpanels, is preparing recommendations for programs attacking the obsolescence of instructional personnel.

A final panel, the **Panel on Biology in the Two-Year College**, is considering the various aspects of biology curricula unique to the two-year college. It is concentrating its efforts at the outset on the biology component of occupation-oriented two-year terminal degree programs.

COMMUNICATION

The Commission feels that the successful achievement of its mission depends upon intensive and continuing efforts to communicate with biologists throughout the country. Accordingly, CUEBS publishes a bimonthly newsletter which is distributed free to approximately 10,000 biologists who have asked to be placed on the mailing list. Other publications, reports, and reprints pertinent to biological education are distributed free as long as the supply lasts; a list of currently available publications follows.

Direct confrontations among biologists are encouraged by CUEBS. A number of regional and state conferences aimed

at considering biology curricula have been held or are currently in various planning stages. These conferences are supported by local funds, and CUEBS cooperates with the local planning committee to insure fruitful debate that can lead to curriculum reform and updating at the various institutions. CUEBS also maintains an active Consultants Bureau to assist individual institutions in evaluating curricula and departmental programs, or to help in the planning of new facilities.

FUTURE PLANS

The Commission recognizes that many of its current programs and activities should and will in time become the direct responsibility of the biological community. Accordingly, as vague ideas evolve into concrete projects, every effort is made to get existing biological organizations to assume complete responsibility for the prosecution of a particular program. An example of such spin-off is the Facilities Panel, which is partially supported by AIBS and should eventually move completely into the AIBS domain. Another example is the attempt of the Instructional Personnel Panel to get existing discipline-oriented biological organizations to assume more responsibility for upgrading instructional personnel in their particular discipline areas, perhaps with coordination through the AIBS.

Biology is a dynamic discipline, forcing us as scientists to continually counter static curriculum and administrative structures which rapidly become obsolete. It is expected that the Commission or its successor organization will eventually confine itself to continued searching analyses and critical reviews of the state of undergraduate biology instruction programs throughout the nation. Recommendations to remedy specific problems will be considered and acted upon by the biological community itself.

COMMISSIONERS (As of June, 1967)

Commission members are Earl D. Hanson (Chairman),* Wesleyan University; Henry Koffler (Vice-Chairman),* Purdue University; Garland E. Allen, Harvard University; Richard V. Bovbjerg, University of Iowa; Martin D. Brown, Fullerton Junior College; Peter F. Buri, New College; Lamont C. Cole, Cornell University; James F. Danielli, State University of New York, Buffalo; Donald S. Farner, University of Washington; Adolph Hecht, Washington State University; Charles E. Holt III, Massachusetts Institute of Technology; Paul DeHart Hurd, Stanford University; Donald Kennedy, Stanford University; Ray Koppelman,* University of Chicago; Ariel G. Loewy,* Haverford College; Leonard Machlis, University of California, Berkeley; James H. Meyer, University of California, Davis; Gairdner B. Moment, Goucher College; David L. Nanney, University of Illinois; Aubrey W. Naylor, Duke University; William K. Stephenson, Earlham College; Alfred S. Sussman, University of Michigan; Carl P. Swanson, Johns Hopkins University; Roy A. Young, Oregon State University.

Ex-officio members are Martin W. Schein (Director);* David G. Barry (Associate Director);* C. Ritchie Bell, University of North Carolina; Frank M. Child, Trinity College; Benson E. Ginsburg, University of Chicago; Clifford Grobstein,* University of California, San Diego; J. Roger Porter, President, AIBS, University of Iowa; Clarence H. Nelson, Michigan State University; Thomas B. Roos, Dartmouth College.

* Executive Committee Members

PUBLICATIONS (Free upon request)

Publication Number

3. Core studies for undergraduate majors: a report on the CUEBS Berkeley and St. Louis Conferences. 1964. *BioScience* 14(8): 25-29.
6. Report of the Western Regional Conference on Courses and Curricula in the Biological Sciences. December, 1964.
7. The Consultants Bureau, 1964-65. December, 1964.
8. Report of the Midwestern Regional Conference on Courses and Curricula in the Biological Sciences. February, 1965.
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10. Report of the Southeastern Regional Conference on Courses and Curricula in the Biological Science. July, 1965.
12. Preparing the modern biology teacher: a position paper of the Panel on Preparation of Biology Teachers. 1965. *BioScience* 15(12): 769-772.
15. Biology in a liberal education: report on the Stanford Colloquium. February, 1967.
16. Guidelines for planning biological facilities. August, 1966.
17. Report of Panel on Preprofessional Training in the Agricultural Sciences. 1967. *CUEBS News* 3(4):1-4.
18. Content of core curricula in biology. Report of the Panel on Undergraduate Major Curricula. June, 1967.

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Hayward, Sumner. 1965. Reward: a changing world and college transition. North Dakota Quarterly, Summer-Autumn.

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Goerdt, Edwin, S. M. 1966. Basic principles of administration. *In* C. Albert Koob [ed.] What is happening to Catholic education? National Catholic Education Association monograph.

Harrison, Robert J. 1967. Studying morphogenesis. Amer. Biol. Teach. 29(2): 103-109.

For copies of publications or further information write Commission on Undergraduate Education in the Biological Sciences, 1717 Massachusets Avenue, N.W., Suite 403, Washington, D. C. 20036.

ADVISORY COUNCIL ON COLLEGE CHEMISTRY

The Advisory Council on College Chemistry (AC_3) is engaged in collecting and disseminating information about effective ways of improving chemistry instruction in two- and four-year colleges, and universities. Within the community of academic chemists, it proposes to provide leadership and stimulus for individual projects which will result in imaginative, up-to-date curricula, more effective tools for learning, improved textual materials, innovations in the experimental aspects of chemistry instruction, better training of faculty for college chemistry teaching, and the creation of exciting and intellectually stimulating interdisciplinary programs for non-science majors. In essence, the AC_3 endeavors to be a nerve center for stimulating chemistry curricular activity in undergraduate higher education.

The AC_3 does not propose to issue dictums, prescribe standardized programs, engage in massive curriculum developments, or to downgrade existing programs. It provides recommendations and advice via reports from conferences of specialists on controversial and timely issues, consultants to individual institutions, and regional meetings to which academic chemists interested in curriculum innovation are invited. A periodic Newsletter provides those who are on the Council mailing list with timely information on activity in chemical education.

THE COUNCIL

The Advisory Council on College Chemistry is an independent group of academic chemists active in teaching and research. This Council emerged from an *ad hoc* conference convened by the National Science Foundation to consider how improvement and innovation in undergraduate chemistry curricula and instruction could be implemented in the most effective manner at the national level. Activities of the Council are supported by NSF grants, as is the work of similar groups in other scientific disciplines.

Those responsible for establishing the Council recognized that much had been accomplished in the field of chemical education by the American Chemical Society, enterprising colleges, universities and foundations, and individual scientists and educators. The AC_3, therefore, was designed not to conflict with these activities, but to complement and supplement them.

The Council elects members for three-year terms. An attempt is made to maintain a reasonable balance of representation among the various types of academic institutions, sections of the country, and fields of chemistry.

Standing committees and *ad hoc* panels are the Council's media for action. They enlist the services of competent chemists in developing programs, holding conferences, and implementing recommendations of the Council. The Council publishes and distributes, through its mailing list, the Newsletter, reports of conferences, resource papers, occasional opinion papers, and such other documents as are approved by the Council. Publications originate at the Executive Office, 701 Welch Road, Palo Alto, California 94304. Any person interested in chemical education may request that his name be placed on the mailing list of the Council.

COMMITTEES AND PANELS

The Council currently has eight standing Committees and *ad hoc* panels. Listed below are these groups and the current activities of each.

A. Curriculum and Advanced Courses Committee
   1. The place of biochemistry in the chemistry curriculum
   2. A topical (conceptual) analysis of the chemistry curriculum
   3. Laboratory programs integrating all areas of chemistry

B. Two-Year College Committee
   1. Guidelines for developing chemistry programs
   2. Library list (joint with the American Association of Junior Colleges and the American Library Association)
   3. Intercommission two-year college panel and liaison with the American Chemical Society

C. Freshman Chemistry Committee
   1. Dynamics in the freshman course
   2. Quantum theory in freshman chemistry
   3. Experimentation with freshman chemistry laboratory

D. Science for Non-Science Majors Committee
   1. The Combined Chemistry-Physics Course (joint with Commission on College Physics)
   2. Conceptual approaches to the non-majors course
   3. Chemistry-Biology Interface paperback series (joint with Commission on Undergraduate Education in the Biological Sciences)
   4. Case histories of courses for non-science majors

E. Teacher Development Committee
   1. The role of junior staff in college and university teaching
   2. The preparation of teachers for the essentially non-research institutions
   3. Combating of subject matter obsolescence among college teachers

F. Teaching Aids Committee
   1. Modern teaching aids for college chemistry
      a. Films, film loops, and film hardware

b. Instant replay video tape techniques
c. Computers as an instructional medium
d. Multisensor meters for lecture room display of experimental data, e.g., temperature, pressure, pH, etc.

2. Listing of instructional films for chemistry
3. Advisory service on instructional media

G. Liberal Arts College Panel

1. The role of liberal arts colleges in the training of chemists
2. A statistical survey and analysis of chemistry programs and graduates of liberal arts colleges

H. Panel on Mathematical Preparation of Chemists

1. Recommendations for the undergraduate mathematical training of chemists.

CONFERENCES

Regional Conferences

One- or two-day conferences covering all colleges in a region are held to apprise the chemistry teachers of important developments and techniques and to obtain feedback for program planning by AC_2. Brief reports of each conference are presented in an edition of the Newsletter, and more extensive reports are sent to all participants and are available on request. Recent regional conferences are listed below.

Trends in Teaching of General Chemistry. Texas A&M University, November 18-19, 1966 (reported in Newsletter No. 7; complete report available on request).

Chemistry for General Education and the Balance Between Theory and Description in General Chemistry. Florida State University and CRICISAM, February 24-25, 1967 (reported in Newsletter No. 9; complete report available on request).

New Approaches to the Teaching of Organic Laboratories. Bellarmine College, March 31-April 1, 1967 (reported in Newsletter No. 9; complete report available on request).

The Unified Undergraduate Laboratory Program. Bucknell University, March 13-April 1, 1967 (reported in Newsletter No. 9).

The General Chemistry Laboratory. Worcester Polytechnic Institute, April 28, 1967.

The Introductory Chemistry Course. University of North Carolina at Charlotte, May 12-13, 1967.

Additional regional conferences have been scheduled for the academic year 1967-68 at the University of Idaho, Washington State University, Millsaps College, and Richmond Professional Institute. Others are planned but not yet scheduled.

AC_2 also has Advisory and Consultant Services. A panel of qualified chemists will provide consulting services to colleges and universities upon request.

COUNCIL OFFICERS AND MEMBERS

Council officers are L. C. King (Chairman),* Northwestern University; W. H. Eberhardt (Vice-Chairman),* Georgia Institute of Technology; D. N. Hume, Massachusetts Institute of Technology, Chairman, Curriculum and Advanced Courses Committee; E. L. Haenisch, Wabash College, Chairman, Editorial Committee; R. J. Kokes, The Johns Hopkins University, Chairman, Freshman Chemistry Committee; W. T. Mooney, Jr., El Camino College, Chairman, Two-Year College Committee; W. P. Kieffer, The College of Wooster, Chairman, Resource Papers Committee; R. C. Anderson, the University of Texas, Chairman, Science for Non-Science Majors Committee; R. C. Brasted, University of Minnesota, Chairman, Teacher Development Committee; and W. T. Lippincott, The Ohio State University, Chairman, Teaching Aids Committee.

Council members are R. C. Anderson, The University of Texas; G. M. Barrow, Case Institute of Technology; G. T. Barthy, Earlham College; H. A. Bent, University of Minnesota; R. C. Brasted, University of Minnesota; M. Kasha, University of California; J. A. Campbell, Harvey Mudd College; W. B. Cook,* Colorado State University; W. H. Eberhardt, Georgia Institute of Technology; H. B. Gray, California Institute of Technology; E. L. Haenisch, Wabash College; D. N. Hume, Massachusetts Institute of Technology; R. T. Baker, The University of Chicago; M. Kasha, Florida State University; W. P. Kieffer, The College of Wooster; L. C. King, Northwestern University; R. J. Kokes, The Johns Hopkins University; E. M. Larsen, University of Wisconsin; W. T. Lippincott, The Ohio State University; H. V. Malmstadt, University of Illinois; W. T. Mooney, Jr., El Camino College; L. E. Nash, Harvard University; M. S. Newman, The Ohio State University; C. C. Price, University of Pennsylvania; C. H. Sadley, University of North Carolina; F. W. Schmitz, New York City Community College; G. T. Seaborg, Atomic Energy Commission; R. L. Walker, Haverford College; P. E. Yankwich,* University of Illinois and J. A. Young, King's College.

PUBLICATIONS (The mailing list exceeds 6000)

Major Reports

1. Instruction in general chemistry and the succeeding student population. September, 1964.
2. Experimental curricula in chemistry. September, 1964.
3. The content of introductory college chemistry. January, 1965.
4. Guidelines and suggested aids list for undergraduate chemistry libraries. April, 1966.
5. Modern teaching aids for college chemistry. December, 1966.
6. Problems in two-year college chemistry. January, 1967.

* Executive Committee Members

Model Laboratory Experiments

1. Modern experiments for introductory college chemistry. September, 1965.
2. Thermochemical investigations for a first-year college chemistry course. January, 1965.

Newsletters

Newsletters were published June, 1963; August, 1964; November, 1965; and April, 1966. Starting with Newsletter No. 5, a synoptic report of a current conference was featured.

Newsletter No. 5, The lecture experiment. August, 1966.

Newsletter No. 6, Lab's love's labors lost? November, 1966.

Newsletter No. 7, Chemistry for non-science majors. January, 1967.

Newsletter No. 8, Dynamics in the freshman course. March, 1967.

Newsletter No. 9, Biochemistry. May, 1967.

Resource Papers

These are authoritative, succinct papers on important chemical topics. Comprehensive bibliographies are featured. Resource papers are published in the Journal of Chemical Education, then reprinted and distributed via the Council mailing list.

1. Cotton, A. F. 1964. Ligand field theory. September.
2. Nash, L. K. 1965. Elementary chemical thermodynamics. February.
3. Benson, S. W. 1965. Bond energies. September.
4. Bent, H. A. 1966. Isoelectronic principle. April.
5. Berry, Stephen. 1966. Atomic orbitals. June.
6. Sturtevant, J. M. 1967. Molecular biology. April.
7. Anderson, R. C. 1967. Flames and combustion. May.

For further information please contact Advisory Council on College Chemistry, Department of Chemistry, Stanford University, Stanford, California 94304.

COMMISSION ON ENGINEERING EDUCATION

Now in its sixth year, the Commission on Engineering Education (CEE) has become a vehicle for the research and development of specific improvements and innovations in engineering education, focusing on institutional development, faculty advancement, improved educational techniques and new approaches to the understanding of engineering. Its existence does not imply a criticism or disaffection with the many other organizations and societies also concerned with engineering education but, rather, a recognition that a multidisciplinary, non-fragmented effort must be made which at the same time would encourage the individual efforts of others. Charged with the responsibility of vigorously developing a program that would have an impact on engineering education, the Commission is independent of, but cooperates with, other established organizations.

Perhaps the most outstanding differences between the Commission on Engineering Education and some of the other college science commissions is that a great many programs and studies which it instigates or initiates eventually are developed and financed outside of its structure, with CEE continuing only as an advisor, monitor, or coordinator. In addition, unlike the other Commissions, CEE is incorporated as a non-profit educational organization, and is completely independent of any other institution or organization. Its financing comes from several sources, and its concerns are much broader, because of the multidisciplinary nature of engineering. Significant also is the fact that its committee members and board of directors represent industry and government, as well as education.

THE COMMISSION

It is an established policy that the Commission elect a working board; its members, therefore, are frequently active on project planning, and individual members have assumed major responsibility for Commission projects or other activities derived from exploratory studies. The Board members represent all disciplines in engineering, as well as industry, government and education.

Members of the Board of Directors are elected for a three-year term and meet three times a year to review ongoing Commission studies and to suggest new ones. At the present time, there are 20 board members. One of their number is appointed Executive Director and serves full-time, administering the complete program of the Commission at its headquarters in Washington, D. C. Permanent, full-time staff is relatively small. On the recommendation of advisory committees or project directors, specially qualified individuals are engaged as consultants for short range, intensive studies.

Commission members are past and present board members or chairmen of advisory committees. These members elect the directors, and the directors elect the officers.

Interspersed with its activities, the Commission, through its Executive Director, is an observer or participant in many other studies and conferences related to engineering education sponsored by other groups. Additional liaison is maintained with the Engineers' Council for Professional Development and the American Society for Engineering Education, whose current presidents serve as ex-officio directors on the Commission's board.

COMMITTEES

The Commission functions with the aid of administrative committees, advisory committees and consultants selected for

specialized tasks. Administrative committees are concerned with the routine operation of the Commission, or as in the case of the Executive Committee, act as an elite study group to make policy recommendations on programs, studies or administration of the Board. The Executive Committee consists of the Chairman, the Vice-Chairman, the Secretary-Treasurer and two other directors nominated by the chairman and elected by the Board. The Executive Director works in close collaboration with this committee. (Membership on all Administrative Committees is taken from the Board of Directors.)

Advisory committees are established for each of the major studies and meet as activities warrant. A committee's members may or may not be Board members; in any event, they are specialists in the matter to which the committee is devoting its attention. The Executive Director may also establish *ad hoc* committees to pursue specialized or short range inquiries. These may ultimately become associated with one of the major studies, and their membership is not necessarily restricted to members of the Board.

Originally, the Commission appointed three overall advisory committees—the Committee on Educational Resources, the Committee on Institutional and Faculty Development, and the Committee for Student Motivation. Actual programs, studies or sponsored conferences have not remained strictly within the province of any one committee.

PROGRAMS, STUDIES AND CONFERENCES

The following are representative of the types of activities in which the Commission has participated over the past six years.

Programs

1. Bi-University Institutional Liaison for Development (BUILD), the experimental program which, through a variety of means, combines the engineering resources of a large, well-established university with those of a smaller but rapidly developing university, to form a prototype for a new way of improving engineering education.
2. Actual involvement of faculty with their students in real engineering situations at separately funded workshops in various engineering institutions (Design Laboratory Workshops).
3. The COSINE (Computer Sciences in Electrical Engineering) Project, which is assisting electrical engineering departments in computer sciences through conferences, institutes, and assembling and dissemination of materials for course and text development.
4. Writing and publication of the book, **The Elegant Solution: Discoveries in Engineering,** aimed at the high school student to provide authentic accounts of actual engineering achievements.
5. Distribution of the book, **Listen to Leaders in Engineering,** aimed at the high school student to provide an insight into the various disciplines of engineering.
6. Sponsorship of a continuous showing of motion pictures of interest to engineering educators at the American Society for Engineering Education annual meetings, 1963 through 1967.
7. Sponsorship and coordination of an exhibit of educational resources at the ASEE annual meetings, 1963 and 1964.
8. Jointly with the CUPM, the publication of the book, **Applications of Undergraduate Mathematics in Engineering.**
9. The development of engineering case studies and their use as an educational resource.

Studies

1. A program to provide U. S. engineering students and faculty experience in real engineering situations, while developing the Latin American engineering institutions they would be visiting.
2. An appraisal of laboratory equipment development in engineering institutions.
3. Exploratory studies on the production of films in shock, dynamics and vibration, and materials processing.
4. Preliminary listing of over 300 films of interest to engineering educators, stimulating the preparation of a proposal for a more definitive effort.
5. Jointly with the Ford Foundation, a survey of summer institutes and programs available to engineering faculty.
6. Dissemination of the case method in engineering education.
7. Modification and revision of the **Engineering Concepts Curriculum Project,** to meet the needs of vocationally oriented high school students, freshmen college students.
8. Exploratory studies in systems engineering.
9. A study of the situation in minerals engineering education.
10. Jointly with the American Society for Engineering Education, the establishment of a computer center to serve the needs of educational institutions.

Conferences

1. **Computer Animation in Educational Films,** jointly with the other college commissions, to provide information and instruction.
2. **The Use of the Computer and Mathematical Techniques in Engineering Design,** for engineering school faculty members responsible for development of courses and curricula in engineering design.
3. **The Third Conference on Engineering Design Education,** with Carnegie Institute of Technology, to provide a forum for the discussion of the various techniques in teaching engineering design.
4. **The Fourth Conference on Engineering Design Education,** with Dartmouth College.

5. **Engineering Education and the Development of Industrial Technology,** to explore ways in which the Department of Commerce could assist local businesses through nearby engineering schools.

COMMUNICATION

The activities of the Commission on Engineering Education are reviewed internally and reported in an annual report. Commission activities also receive a wide audience through reports at various engineering and educational society meetings or publications. CEE has published proceedings of two of its conferences, and newsletters on specific projects as conditions warrant.

FUTURE PLANS

The Commission believes that, given the opportunity and resources, engineering schools have the ability to meet the demands created by larger enrollments and advanced technology. The task can be facilitated and the accomplishment more effective, however, if strong educational research and development activities are actively encouraged. This is the prime objective of the Commission on Engineering Education, and its future.

BOARD OF DIRECTORS

Directors are Richard H. Bolt, Bolt Beranek and Newman, Inc.; Gordon S. Brown, Dean, School of Engineering, Massachusetts Institute of Technology; Ali Bulent Cambel, Director, Research Engineering and Support Division, Institute for Defense Analysis; Paul F. Chenea, Vice President for Academic Affairs, Purdue University; Edward E. David, Jr.** Executive Director, Communications Systems Research Division, Bell Telephone Laboratories; Donald N. Frey, Vice President and General Manager, Ford Division, Ford Motor Company; H. H. Goldstine, Director of Scientific Development, International Business Machines Corp.; L. E. Grinter *(ex-officio)*,* Dean of Graduate School and Director of Research, University of Florida; Newman A. Hall, Executive Director, Commission on Engineering Education; W. R. Hibbard, Jr., Director, Bureau of Mines, U. S. Department of Interior; M. R. Lohmann *(ex-officio)*,* Dean, College of Engineering, Oklahoma State University; W. R. Marshall, Jr.,** Associate Dean and Associate Director, Engineering Experiment Station, University of Wisconsin; Oscar T. Marzke, Vice President, Fundamental Research, United States Steel Corporation; N. M. Newmark,* Head, Department of Civil Engineering, University of Illinois; Max S. Peters, Dean, College of Engineering, University of Colorado; Andrew S. Schultz, Jr., Dean, College of Engineering, Cornell University; Chauncey Starr, Dean, School of Engineering, University of California, Los Angeles; Henry L. Thurman, Jr., Dean, Engineering College, Southern University; John G. Truxal, Provost, Polytechnic Institute of Brooklyn; and John R. Whinnery,** Department of Electrical Engineering, University of California, Berkeley.

Further information may be obtained from the Commission on Engineering Education, 1501 New Hampshire Avenue, N.W., Washington, D.C. 20036.

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* Current Presidents of Engineers' Council for Professional Development and American Society for Engineering Education, respectively.
**Executive Committee Members.

COMMISSION ON COLLEGE GEOGRAPHY

The primary objectives of the Commission on College Geography (CCG) are to (1) encourage and coordinate the efforts of specific institutions in developing unique course programs, (2) develop pertinent materials such as resource materials and annotated lists of relevant published materials, (3) develop methods to increase the effectiveness of undergraduate teaching, (4) serve as a consulting service to aid institutions or individuals in planning changes in geography curricula, (5) investigate ways to further interdisciplinary cooperation, and (6) work in various other ways to improve geographic education in colleges and universities throughout the country.

THE COMMISSION

The Commission, under the auspices of the Association of American Geographers, is composed of a group of recognized scholars drawn from the field of geography and certain related disciplines. Currently, the Commission consists of 15 geographers and three persons in related fields of anthropology, history and education. The Association of American Geographers appoints the Commission members to serve on a three-year basis, and terms of service are staggered so that two to four Commission members are replaced each year. An Executive Office, currently located at Eastern Michigan University, Ypsilanti, Michigan, handles the day-to-day operations of the Commission and coordinates the work of the various panels. *Ex-officio* members include the President, Vice-President, Executive Secretary, Secretary, and Treasurer of the Association of American Geographers and the Chairman of the High School Geography Project, also under the auspices of the Association of American Geographers and supported by the National Science Foundation.

PANELS

The Commission is divided into a group of working panels which consist of both Commission members and outside specialists. There are four major panels of the Commission:

1. A **Panel on Content and Sequence of Courses** investigates ways to improve subject content of courses in geography and related fields;
2. A **Panel on Interdisciplinary Cooperation** explores ways and means to improve interdisciplinary communication between geography and related fields. The nature of geography is such that developments in related fields greatly influence development of its specific subfields and, conversely, developments in geography effect related disciplines. Consistent interdisciplinary working relationships are essential as advances and developments take place in the various college commissions.
3. A **Panel on Methods and Materials** investigates new and more effective modes of instruction. The panel is exploring new and nonconventional instructional methods—such as programmed materials, new types of laboratory experiences, audio-visual materials, structured self-learning programs and improved lecture-discussion methods—that might be adaptable to geography courses.
4. A **Panel on Teacher Improvement** is investigating ways and means to improve faculty competence, recognizing that no new programs can be fully exploited unless augmented by well-trained and highly motivated instructors.

PROGRAMS

Summer Institute

A 1967 Summer Institute for College Teachers in Geography, supported by the United States Office of Education, is being held at the University of Minnesota. The Institute for College Trainers of Teachers, developed jointly with the University of Minnesota, will last seven weeks—June 19 to August 4. A staff of ten professors from leading departments will conduct seminar and field study discussions in introductory courses themes.

Approaches in Introductory Geography Courses

Four new approaches to introductory geography courses have been developed, and were published and distributed to the profession in June, 1967. Field trials of these approaches are being conducted by the authors this summer and fall. The courses are "Introduction to Geographic Behavior," being taught at the University of Cincinnati; "Introduction to the Study of Geography," at the University of Chicago; "World Regional Geography," at the University of Michigan; and "Introduction to Geography: A Spatial Approach" at the University of Iowa. Cooperative evaluation of the field trials is being conducted with the Center for Instructional Research and Curriculum Evaluation, University of Illinois, during the 1967-1968 academic year.

Program Inventory and Development

A Commission subpanel has begun a study on the development of suggested undergraduate programs in geography. A stratified sample has been taken of existing programs in 45 geography departments. Chairmen of the departments participating in the survey met in April, 1967, and focused on the development of model programs and problems of major programs in general. Suggested programs for a variety of institutions are being developed during the summer and fall of 1967. These programs will be published and distributed to the profession in early 1968.

Development of New Subject Matter Materials

A Commission panel is developing three pamphlets to serve as supporting materials for a variety of geography courses. These three pamphlets, dealing with the subjects of remote sensing, environmental pollution, and central place theory, will be available in early 1968. In addition, audio-visual materials to supplement these pamphlets will be developed by a Subpanel on Geographic Media. This subpanel also will make a survey of teaching aids pertinent to the field of geography at the undergraduate college level.

The Teaching of Climatology

A Commission subpanel is developing a new climatology course outline, emphasizing the interdisciplinary aspect of climatology. In addition to geographers, the panel includes meteorologists and representatives from the Commission on Undergraduate Education in the Biological Sciences and the Commission on Education in Agriculture and Natural Resources. The author of this course outline is to be selected shortly and the outline will be available for distribution in early 1968. A Summer Institute on the Teaching of Climatology is being organized for the summer of 1968 (location to be announced shortly).

Development of New Course Outlines

The Commission is expanding its course outline program, developing outlines which will reflect new ideas and approaches in geography, as well as thoughtful re-evaluation of existing approaches. In addition to the course outline on climatology, three other course outlines will be selected for development in the near future.

Conference of Geographers from United States, Britain and Canada

It is contemplated that a conference of Commission members and selected British and Canadian geographers visiting in the United States will be held this fall to discuss common problems in the development of geography courses and programs, and geography's role in changing undergraduate situations in foreign countries.

INTERDISCIPLINARY ACTIVITIES

The Commission has been represented at intercommission conferences dealing with common problems in science education at the college level, as previously mentioned. The Commission, along with the other college commissions, is sponsoring a Conference on Computer Animation to be held on July 17-18, 1967, in Newton, Massachusetts.

The Commission also was represented at meetings of the Central States College Association and participated in California Social Science and Social Studies Committee conferences held in the spring of 1967.

The Commission is assisting the NAC-NRC Committee on the Development of Topographical Maps Illustrating Cultural Features and will cooperate with the Association of American Geographers' Committee on Remote Sensing in organizing a two-week Summer Institute in Remote Sensing. Commission members are actively cooperating in a variety of programs under the auspices of the United State Office of Education. CCG and the editors of the Annals of the Association of American Geographers, Geographical Review, and Economic Geography, are investigating the possibility of developing a series of review articles in selected subfields.

A series of monographs on the role of geography in area studies is being contemplated for development in 1967. It will stress the recent and potential contribution of geography to interdisciplinary area studies research efforts.

COMMISSION MEMBERS

Commission members are Saul B. Cohen (Chairman), Clark University; Edward B. Espenshade, Jr. (Vice-Chairman), Northwestern University; John F. Lounsbury (Project Director), Eastern Michigan University; Richard D. Hecock (Assistant Project Director), Eastern Michigan University; H. Homer Aschmann, University of California; Vernon Carstensen, University of Washington; Fred Eggan, University of Chicago; Norton S. Ginsburg, University of Chicago; William A. Hance, Columbia University; Chauncy D. Harris, University of Chicago; John Fraser Hart, Indiana University; J. Thomas Hastings, University of Illinois; George Kish, University of Michigan; J. Ross Mackay, University of British Columbia; Edward J. Taaffe, Ohio State University; Richard S. Thoman, Ontario Department of Economics and Development; and Wilbur Zelinsky, The Pennsylvania State University.

Ex-officio members are Clyde F. Kohn, President, Association of American Geographers, University of Iowa; John R. Borchert, Vice President, Association of American Geographers, University of Minnesota; John P. Augelli, Secretary, Association of American Geographers, University of Kansas; J. Warren Nystrom, Executive Secretary, Association of American Geographers, Washington, D. C.; Alvin A. Munn, Treasurer, Association of American Geographers, Washington, D. C.; and Gilbert F. White, Chairman, Steering Committee, High School Geography Project, University of Chicago.

PUBLICATIONS

1. Geography in undergraduate liberal education, 1965.
2. A basic geographical library: a selected and annotated book list for American colleges, 1966.*
3. Geographic manpower: a report on manpower in American geography, 1966.
4. New approaches in introductory college geography courses, 1967.
5. Introductory geography: viewpoints and themes, 1967.

Mimeographed, informal reports, **Undergraduate Major Programs in American Geography** and **Geography in Interdisciplinary Studies** are available upon request.

At the end of the year, reports on suggested undergraduate programs in geography, four new course outlines, monographs on the role of geography in area studies, a report of the evaluation of field trials to be conducted at the Universities of Chicago, Cincinnati, Iowa and Michigan, and new subject matter materials on remote sensing, environmental pollution and central place theory, are scheduled for publication.

For further information, write Commission on College Geography, Eastern Michigan University, Ypsilanti, Michigan 48197.

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* Questionnaire to determine the value and need of this manuscript will be distributed to members of the Association of American Geographers shortly. On the basis of this survey, it is tentatively planned that a revised edition will be published in 1969.

COUNCIL ON EDUCATION IN THE GEOLOGICAL SCIENCES

The Council on Education in the Geological Sciences (CEGS), established in 1964 as a project of the American Geological Institute, is supported by the National Science Foundation.

The three principal objectives of CEGS are (1) to develop prototype new instructional materials that will permit a problem-oriented approach to be adopted in introductory and intermediate level geology courses, (2) to develop an effective program to assist college teachers in upgrading their skills and to help assure their continued professional development, and (3) to devise a series of curriculum and course-content guides which will provide for the educational needs of geologists and geophysicists in the foreseeable future.

THE COUNCIL

The CEGS Council is composed of eight to ten members which are appointed for three-year terms by the President of the American Geological Institute. In turn, the Council members elect a chairman and two other members to work with him to form a three-man executive committee.

Professor O. T. Hayward, Baylor University, served as the director of CEGS from 1964 to 1966, when headquarters were maintained at Baylor during that interval. In September, 1966, CEGS headquarters were transferred to Palo Alto, California. Professor John W. Harbaugh of Standard University assumed the director's job at that time.

SUPPLEMENTARY MODULES

CEGS is now beginning the development of a prototype series of instructional materials designed for use in an introductory course or introductory course sequence in geology. The idea is to create "packages" or modules which may be adopted as supplements on an individual basis by geology teachers. Each package will provide an integrated approach to some major problem in geology. The objective is to bring some of the exciting and important major problems "home" to students in introductory courses, permitting a gradual shift from strict presentation of factual material to increased emphasis on problem-solving and understanding. Development of the problem-oriented packages will be on a contractual basis in various institutions, ranging from small colleges to major universities. The problem areas to be undertaken range through the entire spectrum of geology and include topics as diverse as crystal lattices, internal constitution of the earth, sediment transport, structural behavior of rocks, weathering, magnetic differentiation, geochemical evolution of the crust and atmosphere, paleoecology, and organic evolution.

Throughout, CEGS will stress putting the student in the scientist's role. To help him do this, monographs and problem guides will be produced. These will be coupled with suggestions for field observations, with development of apparatus for laboratory demonstrations and experiments, and with development of methods by which students without previous computing experience may perform experiments with computer simulation programs, employing electric typewriters linked with time-sharing computers.

FUTURE PLANS

In providing ways and means of assisting college teachers in continuing their professional development, CEGS will attempt to stimulate and catalyze a broad program that will provide materials for self study, including review articles, annotated bibliographies, and development of a series of individual formal training programs that include short courses held in conjunction with national scientific meetings, university-sponsored short courses, industry-sponsored short courses, and faculty/industrial personnel exchanges.

CURRENT COUNCIL MEMBERS

Council members are Thomas D. Barrow, Humble Oil & Refining Company; Milton B. Dobrin, United Geophysical Corporation; John C. Frye, University of Illinois; William W. Hambleton, Kansas Geological Survey; William Muehlberger, University of Texas; and James B. Thompson, Harvard University.

PUBLICATIONS

Short Review #1. Wyllie, P. J. Experimental petrology: an indoor approach to an outdoor subject.

Short Review #2. Schumm, S. A. The development and evolution of hillslopes.

Short Review #3. Simmons, Gene. Heat flow in the earth.

Short Review #4. Short, Nicholas M. Shock processes in geology.

Short Review #5. Hadley, R. F. Pediments and pediment-forming processes.

Aubritton, Claude, Donald Eckelmann, David B. Kitts, Denis Shaw and R. G. Stearns. Introductory geology in the framework of liberal arts studies.

Eliot, John. Courses in geology for advanced non-majors.

Hayward, O. T. Geology as an interdisciplinary experimental science.

Shea, J. H., W. M. Merrill, J. W. Shrum, *et al.* Earth science teacher preparation.

Mathematics recommendations for undergraduate geology students. GEO-Study Mathematics Panel.

Laporte, Leo F. Evolution as a geologic concept: an introductory geology course.

All publications available from the American Geological Institute, 1444 "N" Street, N. W., Washington, D. C. 20005.

COMMITTEE ON THE UNDERGRADUATE PROGRAM IN MATHEMATICS

The Committee on the Undergraduate Program in Mathematics (CUPM) is a committee of the Mathematical Association of America charged with making recommendations for the improvement of college and university mathematics curricula at all levels and in all educational areas.

CUPM was formed in 1959 as a successor to the Commit-

tee on the Undergraduate Program originally appointed in January, 1953. Since 1960 the Committee's activities have been supported by the National Science Foundation.

PANELS AND SUBCOMMITTEES

Until 1965, CUPM's activities were concentrated in the work of four Panels, two *ad hoc* Subcommittees, the CUPM Consultants Bureau, and the Advisory Group on Communications (AGC). The AGC published the CUPM *Basic Library List* in 1965. The Consultants Bureau was organized in 1961 to send mathematicians on visits to colleges in response to requests either for advice or for an opportunity to discuss local problems with experts from other schools. The names of the Panels and Subcommittees indicate the scope of their curricular interests:

Panel on Teacher Training, Panel on Pregraduate Training, Panel on Mathematics for the Physical Sciences and Engineering, Panel on Mathematics for the Biological, Management, and Social Sciences, *Ad hoc* **Subcommittee on a General Curriculum in Mathematics** and *ad hoc* **Subcommittee on Applied Mathematics.**

Recently there has been a major reorganization of CUPM's activities, reflecting the fact that many of the tasks undertaken originally have now been completed while, in their place, new problems have arisen. Of the Panels and Subcommittees listed above, only the Panel on Teacher Training continues on an active basis.

The Panel on Teacher Training is concerned with the problems of teacher preparation at the elementary and secondary levels. Its report, *Recommendations for the Training of Teacher of Mathematics,* has had a significant effect on raising standards of teacher preparation across the country.

The two Subcommittees published curricular recommendations (*A General Curriculum in Mathematics for Colleges* and *A Curriculum in Applied Mathematics)* and were discharged. The Pregraduate Panel published two reports (*Pregraduate Preparation of Research Mathematicians* and *Preparation for Graduate Study in Mathematics*) and asked to be disbanded, having accomplished its original charge. The other two Panels, having produced over half a dozen monographs between them, requested reorganization on the grounds that most of their task was done, and that remaining work could better be handled by groups organized specifically for this purpose. Accordingly, in the fall of 1966, CUPM created the **Advisory Group on the Applications of Mathematics** to survey the whole area of applications. In addition to this Advisory Group three new Panels were formed, devoted to applications:

Panel on Mathematics for the Life Sciences (R. M. Thrall, Chairman)
Panel on Statistics (H. O. Pollak, Chairman)
Panel on Computing (H. J. Greenberg, Chairman)

CUPM has always been deeply concerned with the role played by mathematics in other disciplines; these changes represent a reorganization of CUPM's activities in this area, based on a reassessment of the relative urgency of the curricular needs among the many fields where mathematics has been found useful.

But there are other changes in CUPM activities much more fundamental than the reorganization of their work concerned with applications. Within the past two years, new Panels have been created to consider the problems of junior colleges and of college teaching in general. There are two new Panels and three new Subpanels:

Panel on College Teacher Preparation
Panel on Mathematics in Two-Year Colleges
- **Subpanel on Mathematics for University Parallel Students**
- **Subpanel on Mathematics for Technical and Occupational Education**
- **Subpanel on Mathematics for General Education in Two-Year Colleges**

These new CUPM activities reflect some phenomenal changes now taking place in undergraduate education in this country. The growth rate for the number of undergraduate majors in mathematics is currently more than three times the growth rate of the whole undergraduate population. Thus the already very serious shortage of qualified teachers of college mathematics courses is rapidly becoming extremely critical. The growth rate of junior college enrollments is nearly twice that for higher education as a whole; the problems of staff, curricula, and programs in this area are as critical as any problems faced today. A major part of CUPM's attention is devoted to problems arising from these very profound changes in undergraduate education.

Among important future activities of CUPM will be special efforts devoted to graduate education. Tentative plans call for the creation of a Consultant Service to advise universities interested in starting or improving masters or doctors programs in mathematics, as well as the creation of special committees to study a variety of aspects of graduate programs. These activities are all contingent on obtaining funds for their operation.

COMMITTEE MEMBERS

Committee members are Richard D. Anderson (Chairman), Louisiana State University; Leon W. Cohen, University of Maryland; M. L. Curtis, Rice University; Charles R. DePrima, California Institute of Technology; Monroe D. Donsker, New York University; Leonard Gillman, University of Rochester; Dwight B. Goodner, Florida State University; Herbert J. Greenberg, University of Denver; I. N. Herstein, University of Chicago; M. Gweneth Humphreys, Randolph-Macon Woman's College; Lowell J. Paige, University of California, Los Angeles; Alex Rosenberg, Cornell University; Robert M. Thrall, University of Michigan; A. B. Willcox, Amherst College; Gail S. Young, Tulane University; and Leo Zippin, City University of New York.

Ex-officio members are E. G. Begle, Stanford University and Edwin E. Moise, Harvard University.

Executive officers are Lincoln K. Durst, Executive Director; and Malcolm W. Pownall, Associate Director.

CUPM PUBLICATIONS

Reports

1. Five conferences on the training of mathematics teachers. 1961.
2. Annual report, July, 1960-August, 1961. (Out of print)
3. The production of mathematics Ph.D.'s in the United States. 1961, 1964. (Out of print)
4. A catalogue survey of college mathematics courses. 1961. (Out of print)
5. Preliminary recommendations on the undergraduate mathematics program for engineers and physicists. (Out of print)
6. Annual report, August, 1961-August, 1962. (Out of print)
7. Ten conferences on the training of teachers of elementary school mathematics. 1962. (Out of print)
8. Annual report, August, 1962-August, 1963.
9. Ten conferences on the training of teachers of elementary school mathematics. 1963.
10. Annual report, August, 1963-August, 1964.
11. Ten conferences on the training of teachers of elementary school mathematics. 1964.
12. Annual report, August, 1964-August, 1965.
13. Eleven conferences on the training of teachers of elementary school mathematics. 1966.
14. Annual report, August, 1965-August, 1966.
15. A summary of the forty-one Level I conferences. 1967.

Monographs

Hamming, R. W. 1966. Calculus and the computer revolution.
Hull, T. E. 1966. The numerical integration of ordinary differential equations.

Panel on Teacher Training

Recommendations for the training of teachers of mathematics. 1961. Revised 1964, 1966.

Course guides for the training of teachers of elementary school mathematics. Fourth Draft, 1964.

Course guides for the training of teachers of junior high and high school mathematics. 1961.

Mathematics text materials for the undergraduate preparation of elementary school teachers. 1965.

Teacher training supplement to the basic library list. 1965.

A study of mathematics requirements for the preparation of elementary school teachers. 1966.

Panel on Pregraduate Training

Pregraduate preparation of research mathematicians. 1963, 1965.
Preparation for graduate study in mathematics. 1965.

Panel on Mathematics for the Physical Sciences and Engineering

Recommendations on the undergraduate mathematics program for engineers and physicists. 1962, 1965, 1967.
Recommendations on the undergraduate mathematics program for work in computing. 1964.
Mathematical engineering: a five year program. 1967.

Panel on Mathematics for the Biological, Management, and Social Sciences

Tentative recommendations for the undergraduate mathematics program for students in the biological, management, and social sciences. 1964.

Advisory Group on Communications

CUPM Basic Library List (1965)

***Ad Hoc* Subcommittee on a General Curriculum in Mathematics**

A General Curriculum in Mathematics for Colleges (1965)

***Ad Hoc* Subcommittee on Applied Mathematics**

A Curriculum in Applied Mathematics (1966)

Consultants Bureau

Consultants Bureau Brochure (Issued annually)

All publications listed are distributed free of charge by CUMP General Office, P. O. Box 1024, Berkeley, California 94701.

COMMISSION ON COLLEGE PHYSICS

The Commission on College Physics (CCP) is charged with the coordination of a national effort to improve physics instruction at the undergraduate level. Its primary functions are (1) the analysis of the problems of college physics teaching, (2) an appraisal of its strength and weaknesses, (3) the stimulation of programs to strengthen physics instruction, and (4) the dissemination of the results of the analysis, the appraisal, and program development to the teaching community.

THE COMMISSION

The Commission consists of 17 physicists—six elected by the academic physics community, eight selected by the Commission itself, and three ex-officio Commissioners from the American Association of Physics Teachers and American Institute of Physics. There are four full-time professional staff members with offices and supporting staff in the Department of Physics, University of Michigan.*

* These offices will be located in the Department of Physics, University of Maryland, as of September 1, 1967.

The CCP has quarterly Commission meetings to provide review and suggestions for action. Panels with members from the CCP and the physics community at large bear responsibility for specific areas; conferences and pilot programs involve and inform the profession, provide examples and lead to "spin-off" of projects.

PROGRAMS

The Commission activities fall roughly into four program areas: (1) curricular analysis and recommendations, (2) course development, (3) new instructional materials and techniques, and (4) general cooperative programs. Within these areas the more important CCP activities are given below.

I. Curricular analysis and recommendations
   - A. Major curriculum: CCP-sponsored meetings of university and college physicists for analysis and recommendations
   - B. High school teacher preparation: CCP **Panel on the Preparation of Physics Teachers** studying problems of curricular revision and student recruitment and designing pilot programs.

II. Course development
   - A. Working groups convened to develop pilot models
   - B. Staff charged with collection and dissemination of information on course development
   - C. CCP stimulating experimentation with subject matter and course structures

III. New instructional materials and techniques
   - A. CCP **Panel on New Instructional Materials**
     1. Exploration of Potentials of New Technologies
        - a. Computer-assisted instruction: conference report* serves as handbook for the profession, and developmental work stimulated by CCP at MIT, SUNY-Stony Brook, and The University of Michigan
        - b. Computer-animated films: staff provides liaison and leadership to exploit national resources and to interest physicists in developmental work
        - c. Single-concept films: national conference held to increase production and use of short films, with the handbook-type report and film bibliography in production
     2. Exploration of new approaches to the creation of new materials
        - a. New approaches to film: film maker-physicist collaboration at several institutions to experiment with new uses of film for instructional purposes
   - B. Resource booklets
     1. Staff compiling booklet, detailing sample approaches to physics laboratory in practice around the country
     2. Staff developing topic "lecture packets," providing resource materials for teachers
   - C. Other resource materials
     1. Resource Letters, initiated by CCP, spun off to AAPT
     2. Momentum Books, published under CCP sponsorship

IV. General cooperative programs
   - A. Promotion for development of university and college regional associations for mutual strengthening of physics programs
   - B. Encouragement of regional centers for pedagogical research and development
   - C. Pilot program for stimulation of college physics research
   - D. General consulting service to aid colleges interested in revising physics offerings

COMMUNICATION

CCP publishes five newsletters per year for a circulation of approximately 18,000. Reports of conferences with national participation are also published and sent to physicists, along with a biennial progress report.

"Grass roots" regional meetings are held to bring work to the attention of physicists and to keep them abreast of new developments. The Commission is represented at AAPT sectional meetings, regional APS meetings, etc.

FUTURE GOALS

The goals of the Commission on College Physics will remain the same in the future as they are at present. As innovation and revision occur, however, and as the academic system continues to change, the CCP programs will change also. The present critical shortage of teachers of high school physics demands our immediate attention; the rapid rise of the junior college system signals an area of future concern.

The long-range goal is to bring into existence in the academic physics community an attitude receptive to continual innovation and renewal, and the institutions to facilitate it. The spectrum of Commission activities and CCP communication with the profession contribute to the former. The programs to establish regional associations and instructional research and development centers give us trial models of the latter.

COMMISSION MEMBERS

Commission members are Herman Branson, Howard University; H. R. Crane, The University of Michigan; Anthony P.

* Report of the Conference on the Use of the Computer in Undergraduate Physics Instruction is available from CCP office.

French, Massachusetts Institute of Technology; Ronald Geballe, University of Washington; E. Leonard Jossem (Chairman), The Ohio State University; Edward D. Lambe (Secretary), State University of New York, Stony Brook; Robert Leighton, California Institute of Technology; Walter C. Michels, Bryn Mawr College; Philip Morrison (Vice-Chairman), Massachusetts Institute of Technology; Melba Phillips, University of Chicago; Robert V. Pound, Harvard University; Robert Resnick, Rensselaer Polytechnic Institute; Allan M. Sachs, Columbia University; and Robert L. Sells, State University College of New York, Geneseo.

Ex-officio members are Arnold B. Arons, (President, AAPT), Amherst College; Stanley S. Ballard, (President-elect, AAPT), University of Florida; and H. William Koch, Director, American Institute of Physics.

PUBLICATIONS

Instruction by design. 1966. Report of the Working Conference on New Instructional Materials in Physics, the University of Washington, June 20-August 21, 1965.

An illustrated report on the teaching materials—monographs, films, laboratory apparatus, and computer programs—developed at Seattle. Included also is a description of a collaborative effort between designers and physicists to construct an instructional sequence in elementary kinematics.

The computer in physics instruction. 1966. Report of the Conference on the Uses of the Computer in Undergraduate Physics Instruction, University of California, Irvine, November 4-6, 1965.

A handbook of current computer technology for physics teaching. Combines discussions of the potential of computer-assisted learning in physics with descriptions of existing computer equipment, physics programs (including a complete flow diagram of an experimental tutorial program on weightlessness), systems already in operation, and available computer languages for use in teaching physics by computer.

Physics for non-science majors. 1965. Proc., Boulder Conference on Physics for Non-Science Majors, University of Colorado, July 20-29, 1964.

A collection of expanded course outlines for several existing physics courses for non-science students, as well as working papers on physical science courses, laboratory experiments, homework problems, etc. Concludes with a section on techniques and materials potentially useful in reaching the non-science audience and a bibliography of science books for the non-science student.

Curricula for undergraduate majors in physics. 1963. Report of the Second Ann Arbor Conference on Curricula for Undergraduate Majors in Physics. November 12-14, 1962.

A summary of three national conferences on physics curricula with the conference recommendations.

Reprints (Journal Issues):

Progress Report of the CCP (through June 1962).

Progress Report of the CCP (through June 1964).

Progress Report of the CCP (through June 1966).

Physics today, March, 1967. Issue on physics teaching.

Reprints (articles):

From 1964 Progress Report issue of American Journal of Physics:

Report of a Conference on Physical Science Courses.

Study programs for college physics teachers—an analysis of supply and demand.

Less may be more.

The Berkeley physics laboratory.

Remedial programs.

Experiences with solder glass and students.

Sealing with solder glass.

Homemade high vacuum techniques.

Undergraduate curricula in physics: a report on the Princeton Conference on curriculum S.

Freedom, responsibility, and barriers.

From 1966 Progress Report issue of American Journal Physics:

Graduate record examination advanced physics test as a predicator of performance.

Dialogues concerning some old sciences—the Seattle interdisciplinary conference.

Language for making movies on a computer.

"New physics" and the Minnesota Conference on New Materials for Introductory Physics Courses for Science and Engineering Majors, May 6-8, 1965.

Physicists and teachers.

Momentum books.

PSNS project at RPI.

Other articles

Dalton, Robert. Sealing with solder glass. Corning Glass Works.

Orsula, Jan. 1964. Power supply for penning vacuum gauge. Am. J. Phys. 32:504.

Michels, Walter C. 1962. The role of experimental work. Am. J. Phys. 30:172-178.

Brown, Sanborn. 1963. Outline of a course in plasma physics. Am. J. Phys. 31:637-691.

Newsletters #1-13 (available from the Commission office.)

For further information, write Commission on College Physics, Physics and Astronomy Building, The University of Michigan, Ann Arbor, Michigan 48104, until September 1, 1967. After that date write Commission on College Physics, Department of Physics, University of Maryland, College Park, Maryland 20742

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